Detecting a film aperture

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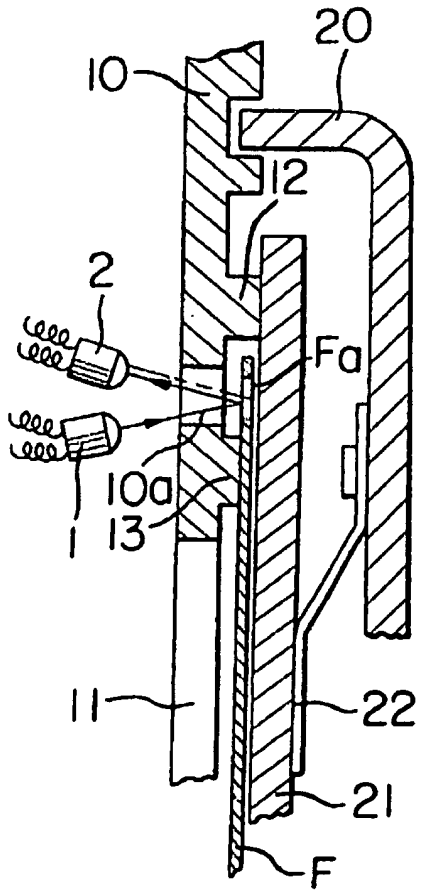
Abstract of **GB2086065**

An aperture in a film is detected by a light-emitting element 1 and light-receiving element 2 on the same side of the film (on either the lens side; as shown, or the camera back side). Various arrangements are illustrated. The light may be infra-red. The aperture may be relatively light or dark compared with the film. The method may control a film counter (the light- emitting element being used to record frame numbers on the film), or detect film sensitivity by the size of the aperture, thus enabling automatic exposure.

FIG. 1



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WC2A 1QU

(54) **Detecting a film aperture**

(57) An aperture in a film is detected by a light-emitting element 1 and light-receiving element 2 on the same side of the film (on either the lens side; as shown, or the camera back side). Various arrangements are illustrated. The light may be infra-red. The aperture may be relatively light or dark compared with the film. The method may control a film counter (the light-emitting element being used to record frame numbers on the film), or detect film sensitivity by the size of the aperture, thus enabling automatic exposure.

FIG. 1

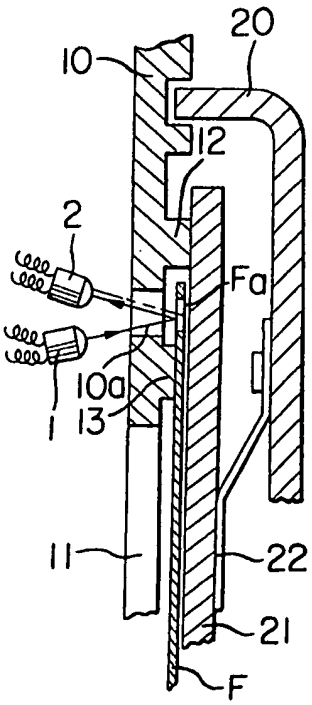

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FIG. 1

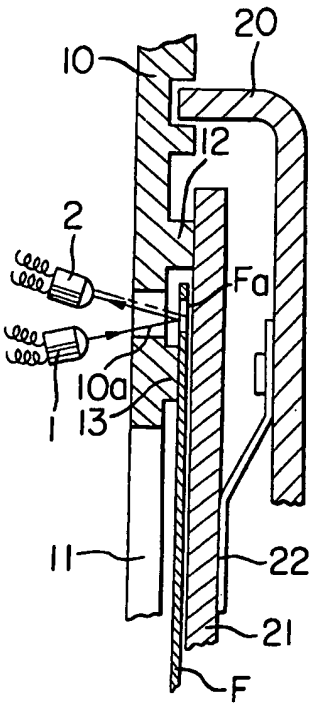


FIG. 2

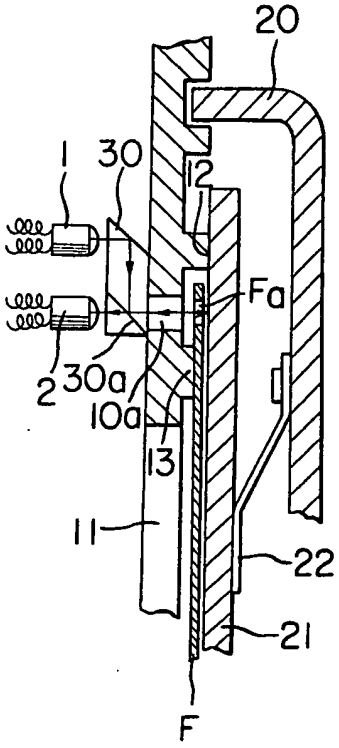


FIG. 3

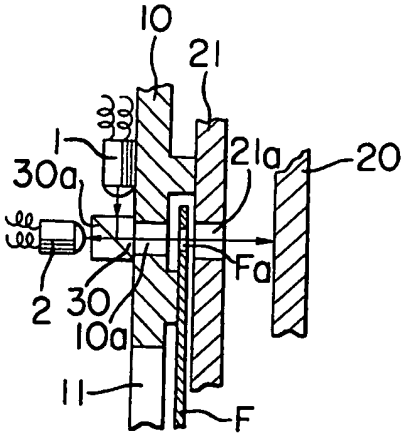


FIG. 4

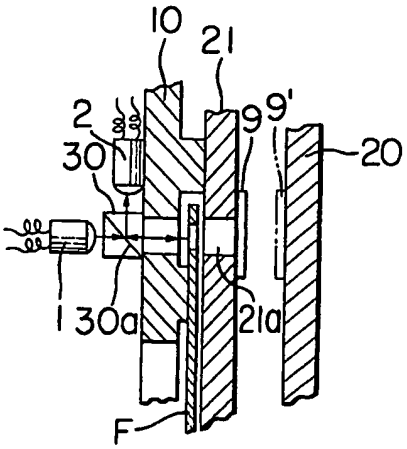


FIG. 5

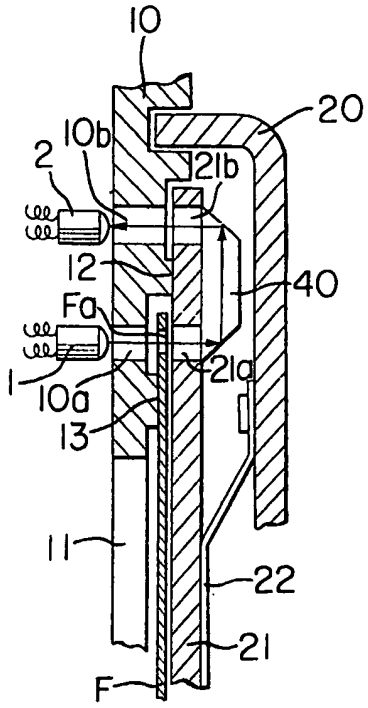


FIG. 6

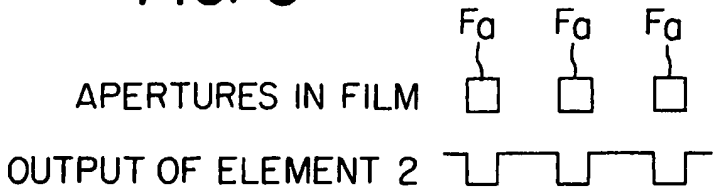


FIG. 7

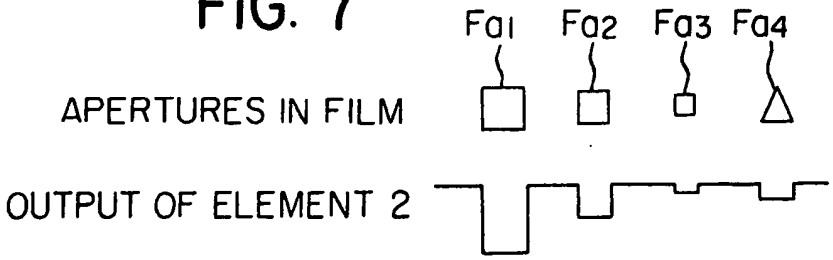


FIG. 8

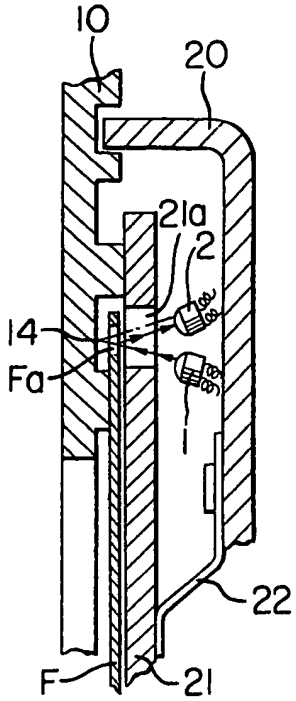


FIG. 9

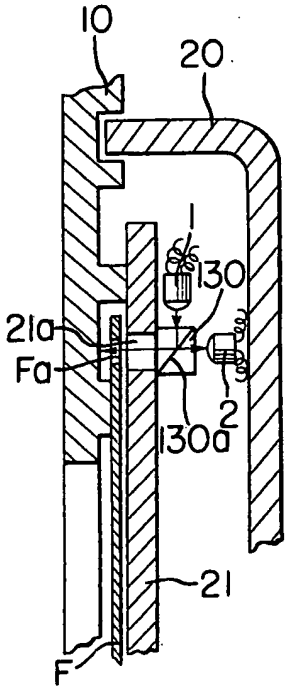


FIG. 10

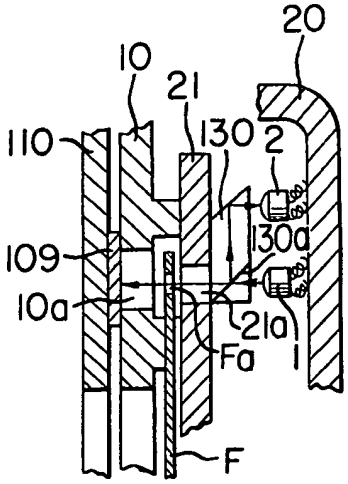


FIG. 11

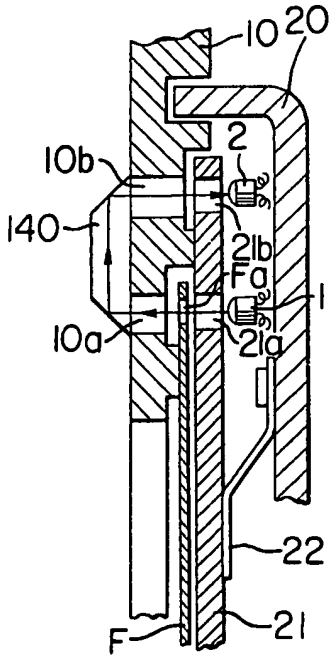


FIG. 12

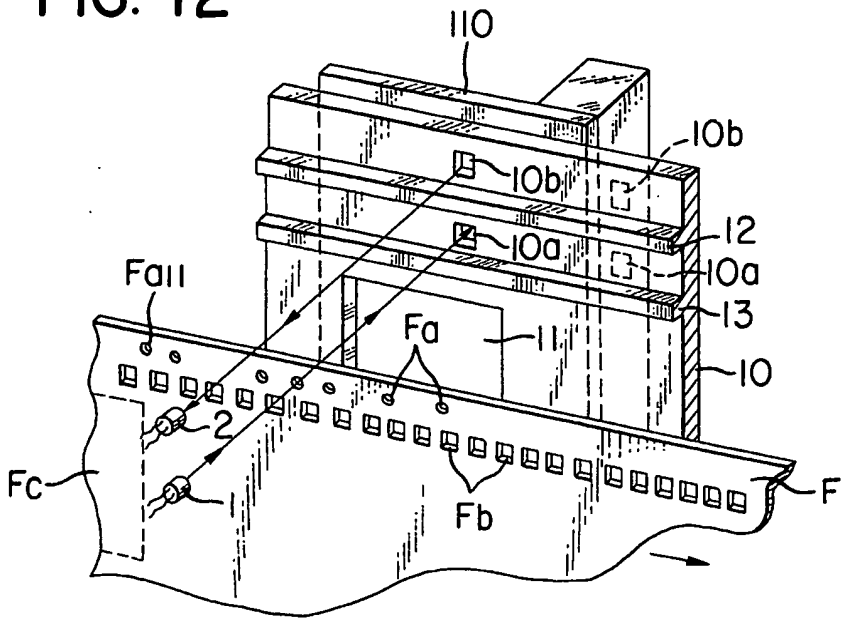

110
10b
10b
12
10a
10a
13
Fa11
Fa
11
10
2
Fc
1
Fb
F

FIG. 13

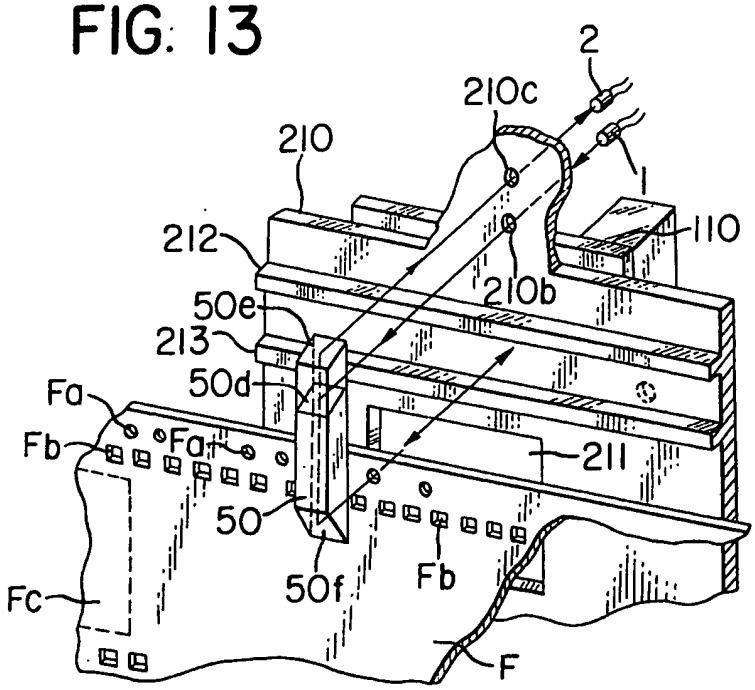

2
210c
210
1
110
212
210b
50e
213
50d
Fa
Fb
Fa
211
50
50f
Fb
Fc
F

FIG. 14

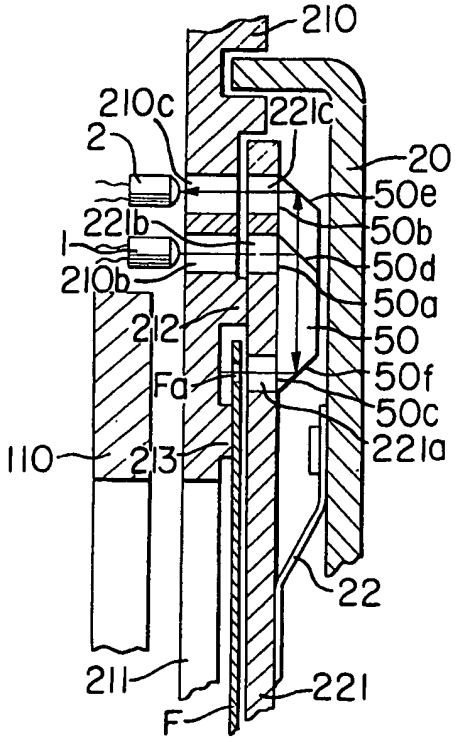


FIG. 15

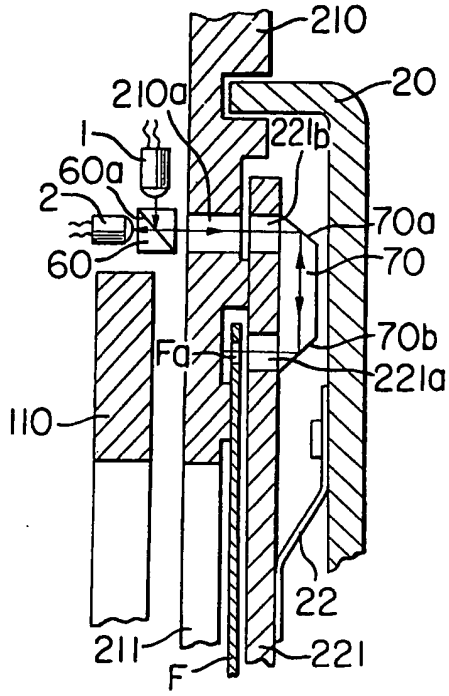


FIG. 16

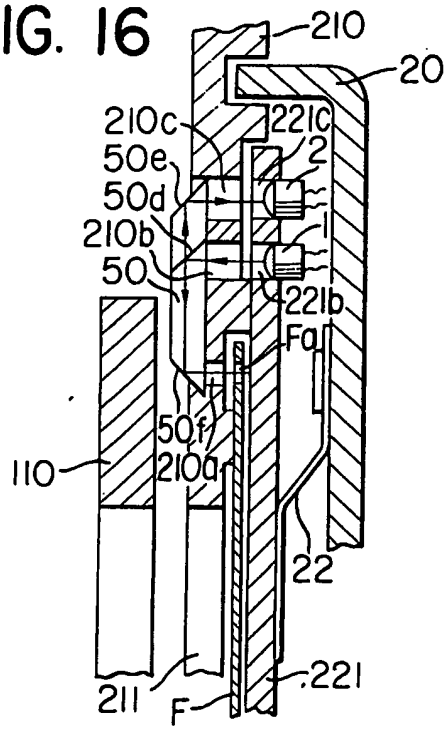


FIG. 17

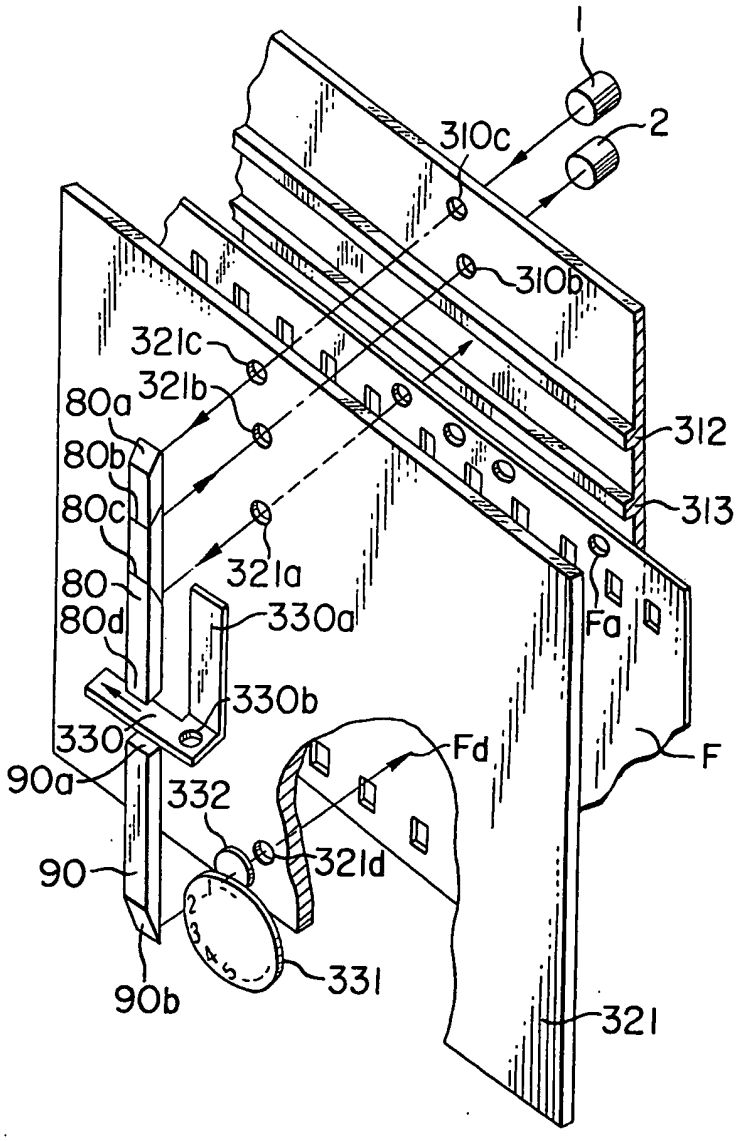
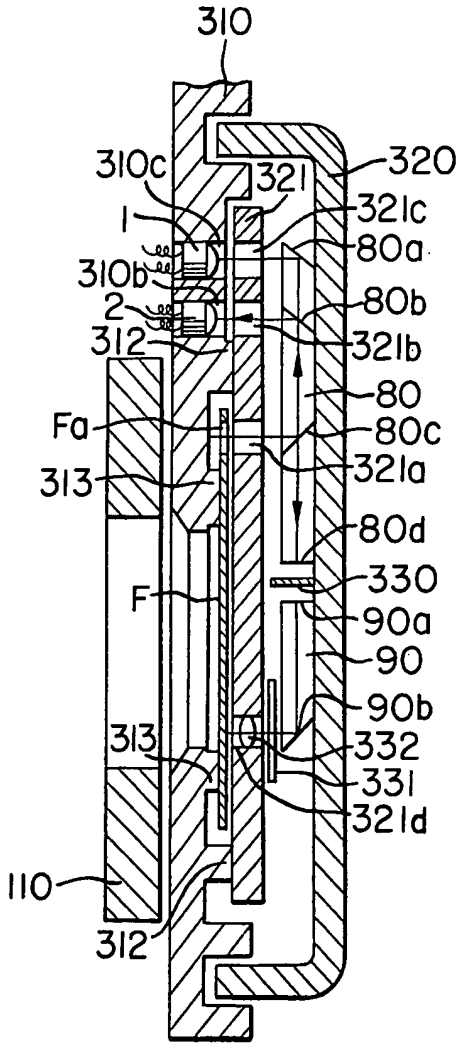

1
2
310c
310b
321c
321b
80a
80b
80c
80
80d
321a
330a
330b
330
90a
332
90
90b
331
312
313
Fa
Fd
F
321

FIG. 18


310
310c
321
320
1
321c
80a
310b
80b
2
321b
312
80
Fa
80c
313
321a
80d
330
F
90a
90
90b
313
332
331
321d
110
312

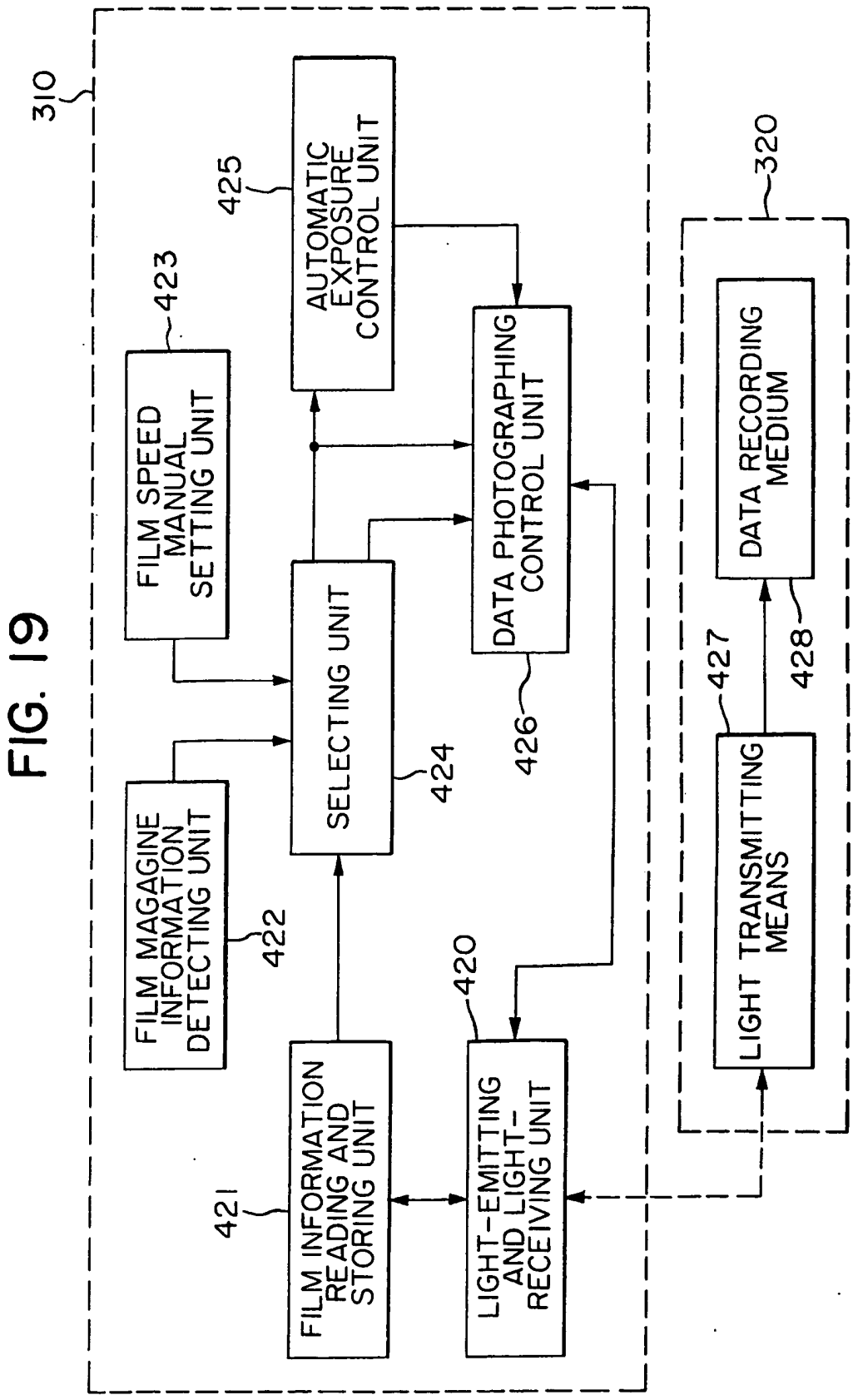
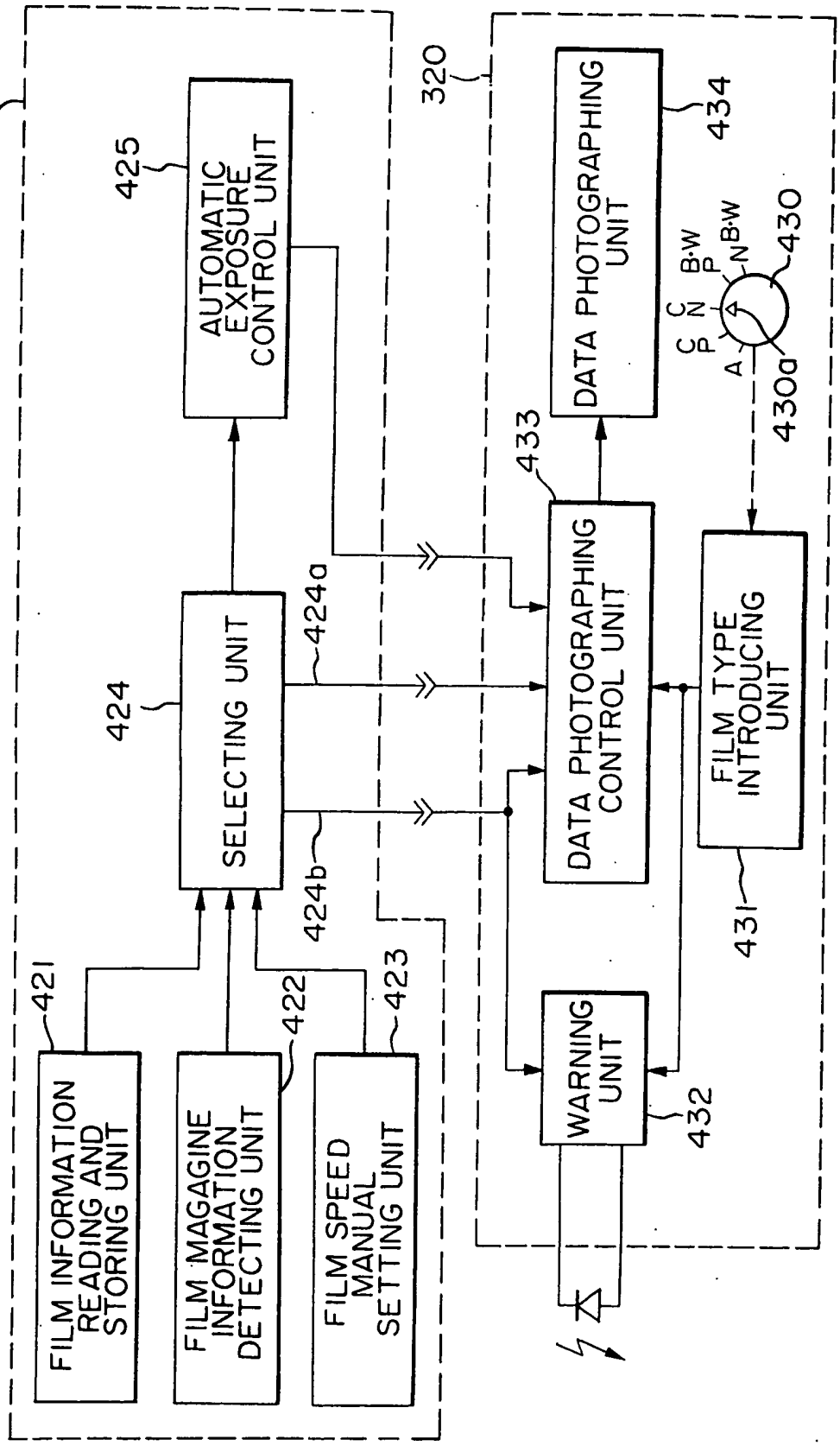

310
320
AUTOMATIC EXPOSURE CONTROL UNIT
425
FILM SPEED MANUAL SETTING UNIT
423
DATA PHOTOGRAPHING CONTROL UNIT
SELECTING UNIT
424
426
FILM MAGAGINE INFORMATION DETECTING UNIT
422
FILM INFORMATION READING AND STORING UNIT
421
LIGHT-EMITTING AND LIGHT-RECEIVING UNIT
420
DATA RECORDING MEDIUM
427
428
LIGHT TRANSMITTING MEANS

FIG. 19

FIG. 20


310
320
425
AUTOMATIC EXPOSURE CONTROL UNIT
434
DATA PHOTOGRAPHING UNIT
C P
N B·W
A
N B·W
430
430a
424
SELECTING UNIT
424a
424b
433
DATA PHOTOGRAPHING CONTROL UNIT
FILM TYPE INTRODUCING UNIT
431
421
FILM INFORMATION READING AND STORING UNIT
422
FILM MAGAGINE INFORMATION DETECTING UNIT
423
FILM SPEED MANUAL SETTING UNIT
WARNING UNIT
432

SPECIFICATION

Camera having a device for detecting an opening in a film

Background of the Invention

Field of the Invention

This invention relates to a device for photoelectrically detecting an opening in a film within a camera.

Description of the Prior Art

Attempts have heretofore been made to electrically count a series of perforations formed in a roll of film to enable feeding of the film by meshing with the sprocket of a camera, and control a film feeding mechanism, a film counter or the like. According to the technique heretofore proposed, a light-emitting element and a light-receiving element are opposed to each other with the perforations of the film interposed therebetween and the light transmitted through the perforations is measured to thereby photoelectrically detect the perforations. In such arrangement of the light-emitting element and light-receiving element, one of the elements is disposed on the camera body side and the other element is disposed on the camera back lid side, and this leads to complicated electrical wiring including the electrical connection between the camera body and the back lid. Also, in cameras which have no ample space therein, it is sometimes difficult in terms of space to have the light-emitting element and the light-receiving element opposed to each other with a film interposed therebetween.

Summary of the Invention

It is a primary object of the present invention to provide a device for photoelectrically detecting an opening in a film which eliminates the above-noted disadvantages by having a light-emitting element and a light-receiving element suitably disposed in the narrow space within a camera.

To achieve such object, in the device of the present invention, both of the light-emitting element and the light-receiving element which require electrical connection therebetween are disposed on one side with respect to the film and light-directing means is provided for forming a light path leading from the light-emitting element to the light-receiving element through the film surface or an opening in the film.

Both of the light-emitting element and the light-receiving element may be disposed either on the phototaking lens side with respect to the film or on the camera back lid side.

The openings in the film to be detected by the device of the present invention may be either a series of perforations provided for the feeding of the film or signal openings having information representing the type of the film such as film speed, etc. Particularly, where the latter openings are to be detected, in a preferred embodiment of the present invention, the information obtained from the light-receiving element is useful for the exposure control of a data photographing device for recording photography data on the film surface by exposure.

The invention will become more fully apparent from the following detailed description thereof taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

Figures 1 to 5 are cross-sectional views of essential portions of the cameras according to embodiments of the present invention in which light-emitting and light-receiving elements are disposed on the phototaking lens side with respect to film.

Figures 6 and 7 show the output signal of the light-receiving element for the apertures in the film.

Figures 8 to 11 are cross-sectional views of essential portions of the cameras according to embodiments of the present invention in which light-emitting and light-receiving elements are disposed on the back lid side with respect to the film.

Figure 12 is a perspective view of the Figure 11 embodiment.

Figure 13 is a perspective view of the Figure 14 embodiment.

Figures 14 to 16 are cross-sectional views of essential portions of the cameras according to further embodiments of the present invention.

Figure 17 is a perspective view of essential portions of a camera according to an embodiment of the present invention which is provided with a data photographing device.

Figure 18 is a cross-sectional view corresponding to Figure 17.

Figure 19 is a block diagram of the camera according to the Figure 17 embodiment.

Figure 20 is a block diagram of a modification of the Figure 19 embodiment.

Description of the Preferred Embodiments

Each of embodiments shown in Figures 1 to 5 is constructed with both a light-emitting element and a light-receiving element being disposed in a camera body on the phototaking lens side relative to a film. Each of these figures shows a cross-section of essential portions of camera parallel to the optical axis of the phototaking lens. In Figure 1, a film F is fed into a gap formed by the camera body 10 formed with an exposure aperture 11 for causing the light beam from the phototaking lens, not shown to pass onto the film F during exposure and two film guide rails 12 and 13 extending in the direction of feed of the film F, and a film pressing plate 21 fixed through a plate spring 22 to a back lid 20 openably provided to the camera body for permitting loading and removal of the film. The film F is formed with a perforation or an aperture Fa representing any signal, and a through hole 10a is formed in the portion of the camera body which is opposed to the aperture Fa. Specifically, this through hole 10a is formed between the outer rail 12 of the camera body 10

which directly bears against the pressing plate 21 and the inner rail 13 positioned inside of the outer rail 12 and capable of bearing against the surface of the film F. In the camera body, a light-emitting element 1 and a light-receiving element 2 are disposed so that the light from the light-emitting element 1 passes through the hole 10a in the body to irradiate the film F and the light-receiving element 2 can receive the reflected light; from the film through the hole 10a in the body. When the aperture Fa in the film is not in register with the hole 10a in the body, the light emitted from the light-emitting element 1 is reflected by the surface of the film and received by the light-receiving element 2. When the film is fed and the aperture Fa has come into register with the hole 10a in the body, the element 2 receives the light reflected by other body than the film surface, here, the surface of the pressing plate 21. Generally, the reflection factor of the pressing plate is lower than that of the film and therefore, a difference is created in the light reception output. This is shown in Figure 6. If the reflection factor of the pressing plate in the portion thereof which relfects light is made higher than that of the film, the output will become reverse. A similar output will be obtained if a body different in reflection factor from the film is embedded in or attached to the portion of the pressing plate which is opposed to the hole 10a in the body. Accordingly, the presence of the aperture Fa in the film can be detected from the difference in light reception output.

In Figure 2, a prism 30 for directing the light emitted from the light-emitting element 1 to the hole 10a in the body is provided in the body. The prism 30 has a semi-transmitting surface 30a and directs to the light-receiving element 2 the light reflected by the film F of the light passed through the film aperture Fa and reflected by other body. The positions of the light-emitting element 1 and the light-receiving element 2 may be reversed.

The embodiment of Figures 1 and 2 have been of a construction such that when the aperture Fa in the film has come into register with the hole 10a in the body, the reflected light from the pressing plate 21 is received, while the embodiment of Figure 3 is of a construction such that a hole 21a is formed in the pressing plate 21 at a position therein corresponding to the hole 10a in the body and the light passed through the aperture Fa in the film is not reflected or is very weakly relfected by the back lid. It is a necessary condition that a significant difference from the reflection by the film is created and therefore, similar detection is possible even if no light is received by the light-receiving element 2 when the aperture Fa has come into register with the hole 10a.

Figure 4 shows an embodiment in which a light-absorbing member 9 such as black cloth is attached to the pressing plate 21. The light-absorbing member may also be fixed to the position 9' on the back lid. Alternatively, the light-absorbing member 9 may be replaced by a member such as a mirror having a high reflection factor and a difference between the reflected light from the film and the output may be created to effect the detection of the presence of the aperture Fa.

In each of the embodiments of Figures 2 to 4, both irradiating light and relfected light pass through the hole 10a in the body and therefore, a light path splitter 30 such as a half mirror has unavoidably been required in the body 10. The light path splitter is generally disadvantageous in effective utilization of the quantity of light, but by constructing it as shown in Figure 5, the light from the light-emitting element 1 can be effectively utilized. In Figure 5, two through holes 10a and 10b are formed in the camera body 10 in opposed relationship with the elements 1 and 2. One through hole 10b is provided in the portion of the camera body which is not opposed to the film. Through holes 21a and 21b opposed to the through holes 10a and 10b in the body are also formed in the pressing plate 21. Arbitrary light-transmitting means 40 for directing the light from the through hole 21a to the through hole 21b is attached to the pressing plate 21. In the embodiment shown, the light-transmitting means 40 is formed by a prism having two reflecting surfaces, but may be any means including optical fiber. With this construction, when the aperture Fa in the film is opposed to the hole 10a in the body, the illuminating light from the light-emitting element 1 passes through the hole 10a in the body, the aperture Fa in the film, the through hole 21a, the light-transmitting means 40, the through hole 21b and the hole 10b in the body to the light-receiving element 2. On the other hand, when the aperture Fa in the film is not opposed to the hole 10a in the body, a slight quantity of light transmitted through the film F passes through the same route to the light-receiving element 2. The light-emitting element 1 and the light-receiving element 2 are embedded in the holes 10a and 10b, respectively, in the body and this is preferable in terms of the space occupied thereby. Further, the light-transmitting means 40 may be directly attached to the back lid 20, and the through hole 21b in the pressing plate becomes unnecessary depending on the position of the hole 10b in the body.

Further, if apertures different in shape and size as shown in Figure 7 are formed in the film, the information from the film can be readily detected by way of the difference in output level of the light-receiving element. For example, the the apertures Fa_1, Fa_2 and Fa_3 are defined as ASA400, 100 and 64, respectively, and corresponding apertures are provided in each film, the ASA speed of that film can be detected from the output level of the light-receiving element 2 within the camera and the information can be automatically utilized for the function of the camera. It is desirable that light to which the film in use is not sensitized (for example, infrared light for ordinary film) be used as the light of the light-emitting element so that the film is not sensitized to the light of the light-emitting element.

Each of embodiments shown in Figures 8 to 12 is of a construction in which both the light-emitting element and the light-receiving element are disposed on the back lid side of the camera relative to the film.

In Figure 8, a through hole 21a is formed in the pressing plate 21 to form a light path between the light-emitting and light-receiving elements 1 and 2 disposed in the back lid 20 and the aperture Fa in the film. These elements 1 and 2 may alternatively be disposed in a member such as pressing plate 21 fixed to the back lid. When the aperture Fa in the film is not in register with the hole 21a in the pressing plate, the light emitted from the light-emitting element 1 is reflected by the film surface and received by the light-receiving element 2. When the film is fed and the aperture Fa has come into register with the hole 21a in the pressing plate, the light reflected by other body that the film surface, here, the surface 14 of the camera body, is received by the light-receiving element 2.

Figure 9 shows an embodiment in which a prism 130 similar to the prism 30 of Figure 3 for directing the light from the light-emitting element to the hole 21a in the pressing plate 21 is provided on the back lid side.

Figure 10 shows an embodiment in which a hole 10a is formed in the body 10 at a position corresponding to the hole 21a in the pressing plate and the light passing through the aperture Fa in the film is reflected by a reflecting plate 109 or a shutter base plate 110.

Figure 11 illustrates an embodiment in which another hole 21b, in addition to the hole 21a, is formed at the portion of the pressing plate 21 which is not opposed to the film and the light-receiving element 2 is disposed thereat and through holes 10a and 10b opposed to the holes 21a and 21b in the pressing plate are likewise provided in the body 1 and arbitrary light-transmitting means 140 for directing the light from the through hole 10a to the through hole 10b is provided in the body 10.

Referring to Figure 12, there is shown a schematic perspective view of the Figure 11 embodiment. As shown there, film F is formed with signal apertures Fa in addition to perforations Fb, and these apertures Fa are irradiated by the light-emitting element 1 on the back lid side and the light is received by the light-receiving element 2.

If the series of signal apertures Fa in the film represent, for example, the sensitivity of that film, such signal apertures Fa must be detected before the photographing on the first frame of the film is started. However, it is conceivable that, of the series of signal apertures Fa in the film, the last signal aperture Fa_{11} exists just before the first frame Fc of the film. If, as indicated by dotted lines, the body holes 10a and 10b for detection are provided at positions deviated from the film exposure aperture 11 toward the film take-up chamber and the light-emitting and light-receiving elements are made to be opposed thereto, the signal aperture Fa_{11} cannot be detected even if the film is fed until the first frame Fc comes to be opposed to the aperture 11 in preparation for photography. Therefore, in the present invention, to avoid this, the body holes 10a and 10b for detection are provided above or below the aperture 11 or toward the film supply chamber from the aperture 11, and the light-emitting element 1 and light-receiving element 2 are disposed correspondingly thereto. Thus, the reading of the series of film signal apertures Fa can be completed after the film is loaded into the camera and before the first frame is fed to the photographing position.

The gap between the body 10 and the shutter base plate 110 is only slight and therefore, the embodiment of Figures 11 and 12 in which the light-emitting and light-receiving elements are provided on the back lid side and a light guide is provided on the body side is more advantageous than the embodiment of Figure 5 in which the two elements are provided on the body side above or below the aperture.

Each of the embodiments shown in Figures 13 to 16 is one in which the light-emitting element and the light-receiving element can be disposed at spaced apart positions which are not opposed to the film and a degree of spatial freedom is obtained in the selection of the positions at which the two elements are disposed.

In Figures 13 and 14, a pair of vertically juxtaposed light-emitting and light-receiving through holes 210b and 210c are formed in a camera body 210 above an aperture 211 and above an outer rail 212. These through holes 210b and 210c overlie the upper end of a shutter mechanism 110. A light-emitting element 1 such as LED contained in the camera body 210 is opposed to the light-emitting through hole 210b, and a light-receiving element 2 such as a photodiode contained in the camera body is likewise opposed to the light-receiving through hole 210c. Alternatively, these light-emitting and light-receiving elements 1 and 2 may be embedded in their corresponding through holes 210b and 210c, respectively.

In a pressing plate 221, there are formed a light-emitting through hole 221b and a light-receiving through hole 221c at positions opposed to the through holes 210b and 210c, and a film aperture illuminating through hole 221a of such a size that can illuminate a film aperture Fa is formed at a position opposed to a series of film apertures Fa. A light-directing member 50 constituted by a prism is secured to the pressing plate 221. The light-directing member 50 has an entrance surface 50a opposed to the light-emitting through hole 221b, an exit surface 50b opposed to the light-receiving through hole 221c, an entrance-exit surface 50c opposed to the illuminating through hole 221a, and a semi-transmitting surface 50d, a reflecting surface 50e and a reflecting surface 50f corresponding to the entrance surface 50a, the exit surface 50b and the entrance-exit surface 50c, respectively. With the above-described construction, the light from the

light-emitting element 1 passes through the light-emitting through holes 210b, 221b to the entrance surface 50a of the light-directing member 50 and is reflected toward the reflecting surface 50f by the semi-transmitting surface 50d, and then again reflected by the reflecting surface 50f and exits from the entrance-exit surface 50c.

In the embodiment of Figures 13 and 14, separate through holes 210b and 210c are prepared for the light-emitting element and the light-receiving element, but alternatively a common through hole may be provided for the two elements. In Figure 15, common through holes 210a and 221b are formed in the camera body 210 and the pressing plate 221, respectively. A prism 60 having a semi-transmitting surface 60a is disposed in opposed relationship with the common through hole 210a. A light-emitting element 1 and a light-receiving element 2 are disposed adjacent to the prism 60. On the other hand, a light-directing member 70 on the back lid 20 side of the camera is of a simple construction having reflecting surfaces 70a and 70b opposed to the common through hole 221b and the illuminating through hole 221a.

With such a construction, the light from the light-emitting element 1 is reflected by the semi-transmitting surface 60a, passes through the common through holes 210a, 221b, the light-directing member 70 and the illuminating through holes 221a, is reflected by the film body or the camera body 210, passes through the same light path to the semi-transmitting surface 60a, and passes therethrough to the light-receiving element 2.

The embodiment of Figure 16 is one in which the light-emitting and light-receiving elements of Figure 14 are mounted on the camera back lid side and the light-directing member is mounted on the camera body side. The light-emitting element 1 and the light-receiving element 2 are embedded in a light-emitting through hole 221b and a light-receiving through hole 221c, respectively, on the back lid side, an illuminating through hole 210a is formed in the camera body 210 at a position opposed to the film aperture Fa, and a light-directing member 50 entirely identical to that of Figure 14 is mounted to the camera body so that the semi-transmitting surface 50d and the reflecting surfaces 50e, 50f thereof are opposed to the light-emitting through hole 210b, the light-receiving through hole 210c and the illuminating through hole 210a, respectively. Where the gap between the shutter mechanism 110 and the camera body 210 is small, the light-directing member 50 may preferably be embedded in the camera body 210, as shown.

The embodiment which will now be described is constructed such that when use is made of a film on which information regarding the type of the film such as film speed, etc. is pre-recorded, that information is automatically read by the detecting device so far described and the quantity of emitted light of the light source for data photographing is controlled on the basis of the thus read information. Accordingly, the photographing of data onto film by the data photographing device can be accomplished by a quantity of light suitable for that film without special setting operation.

In Figures 17 and 18, film information apertures Fa which digitally represent film speed, lattitude, distinction between monochrome and color, distinction between negative and positive, etc. are scattered in a predetermined area between the leading end of film F to the first photographing frame. In the camera body 310, through holes 310b and 310c are formed above an upper outer rail 312, and a light-emitting element 1 and a light-receiving element 2 are opposed to the through holes, respectively. These holes 310b and 310c, as clearly shown in Figure 18, are provided at positions which are not opposed to film F and which do not interfere with the shutter device 110 of the camera. In a pressing plate 321, there are also formed through holes 321b and 321c opposed to these body holes 310b and 310c. A through hole 321a is formed at a position opposed to the information aperture Fa in the film. A light guide 80 for directing the light from the hole 321b to the hole 321a and for directing the light from the hole 321a to the hole 321c is mounted to the pressing plate 321 or the back lid 320.

By such a construction, detection of film information apertures Fa is effected in a manner substantially similar to that described in connection with Figure 14. The light guide 80 has a reflecting surface 80a and semi-transmitting surface 80b, 80c.

Simultaneously with the detection of the information aperture Fa, the feeding of the film is detected by means, not shown. This film feeding may be detected either by photoelectrically or magnetically counting the perforations in the film or by detecting the rotational displacement of film feed means such as a sprocket by some means.

The position of the information aperture Fa is prescribed for the film and therefore, if the detection of the feeding of the film is compared with the detection of the presence of the information aperture Fa, it will become possible to extract from the film a digital signal representing the information of the film.

As described above, the film information apertures Fa are scattered in a predetermined area between the leading end of the film to the first photographing frame and therefore, the photoelectric reading of the above-described information apertures is completed while the film F is being fed until the first photographing frame becomes opposed to the exposure aperture, and the film information is stored in memory means, not shown. After completion of the reading of the film information, a shutter lever 330 is moved in the direction of arrow, for example, in response to a film counter, not shown. By this movement, the bent portion 330a of the lever 330 arrives at a position opposed to the hole 321a in the pressing plate, thereby preventing the illuminating light from the light-emitting element 1 from reaching

the film through the hole 321a in the pressing plate. Simultaneously therewith, the hole 330b in the lever 330 becomes opposed to the end surface 80d of the light guide 80, so that the illuminating light of the light-emitting element 1 is transmitted from the end surface 90a of a light guide 90. The end surface 90a is perpendicular to the optical axis. The light transmitted to the light guide 90 is reflected by a total reflection surface 90b to illuminate a data film 331 on which data to be photographed is recorded, and can pass through a data photographing lens 332 and a hole 321d in the pressing plate to the reverse side of the film F. Accordingly, the light-emitting element 1 for photoelectrically detecting the film information apertures can be used also as the light source for data photographing to thereby enable data to be photographed on the film F from the reverse side thereof.

The small portion Fd of the film F in which this data is photographed is within the photographing picture plane. Accordingly, if the data photographing density is determined with not only the film type such as film speed but also the brightness of an object image formed in the small portion Fd being taken into account, the data of proper density clearly discriminable relative to the object can be photographed. In the present embodiment, the light-receiving element 2 is used also to detect the illumination of the aforementioned small portion Fd of the film during photography. That is, when the aperture is opened by the shutter device 110, the film F is exposed to the light passed through the phototaking lens, not shown. Usually, the sensitive film is made of a translucent material so as to be capable of transmitting therethrough part of the incident light. Part of this transmitted light passes through the aforementioned small portion Fd of the film and through the pressing plate hole 321d, lens 332, photographing data film 331, light guide 90, hole 330b, light guide 80, surface 80b, pressing plate hole 321b and body hole 310b to the light-receiving element 2. The output of this light-receiving element 2 represents the illumination of the small film portion Fd on which data is to be photographed and therefore, if the light-emitting brightness or the light-emitting time of the light-emitting element 1 during data photgraphing is controlled by the metering output and the previously read film information (film speed, lattitude, distinction between monochrome and color, etc.), photographing of the data of proper density corresponding to the film in use and the object being photographed will become possible.

In the present embodiment, the light-emitting element 1 for detecting the film information apertures has been used also as the data photographing light source, but other light-emitting element may also be used. For example, use may be made of a perforation detecting light-emitting element for photoelectrically detecting movement of the film. Also, while the object brightness of the data photographing portion has been measured by the film information aperture detecting light-receiving element 2, other light-receiving element may safely be utilized. For example, the perforation detecting light-receiving element may be used also for such purposes.

Further, the light transmission change-over means, in the present embodiment, is a mechanical means using the shutter lever 330, but it may safely be replaced by an electrical or electromagnetic optical element such as liquid crystal or electro-chromic element.

An embodiment of the data photographing device will now be described in detail by reference to the block diagram of Figure 19.

In Figure 19, reference numeral 420 designates a light-emitting and light-receiving unit including the light-emitting element 1 and light-receiving element 2 shown in Figure 17. A film information reading and storing unit 421 controls the light-emitting and light-receiving unit 420 during photoelectric reading of film information apertures to cause the light-emitting element 1 to emit light and stores the output of the light-receiving element 2 as the film type information. A film magazine information detecting unit 422, as shown, for example, in Japanese Patent Publication No. 31539/1986 (U.S. Patent 4,024,557) detects the film speed from a signal attached to the film magazine. A film speed manual setting unit 423 introduces the film speed by manual setting where use is made of a film having no film information aperture or no signal in the magazine thereof. A selecting unit 424 alternately selects the outputs of the film information reading and storing unit 421, the magazine information detecting unit 422 and the film speed manual setting unit 423 and puts out a film speed signal to output line 424a and a film type signal such as latitude, distinction between monochrome and color, etc. to output line 424b. An automatic exposure control unit 425 calculates a proper exposure value from the film speed signal from the output line 424a and the metering output of an object brightness measuring unit, not shown, and controls the exposure. A data photographing control unit 426 calculates the quantity of emitted light of the light-emitting element 1 for data photographing from the output of the light-receiving element 2 of the light-emitting and light-receiving unit 420 which represents the illumination of the small film portion Fd resulting from the opening of the shutter, and the film speed signal and film type signal from the output lines 424a and 424b. The above-described units 420—426 are provided on the camera body 310 side. Light transmitting means 427 comprises the light guides 80 and 90 of Figure 17. Data recording medium 428 is the data film 331 of Figure 17. The light transmitting means 427 and the data recording medium 428 are provided on the camera back lid 320 side. Operation will now be described.

(A) A case where a film formed with film information apertures as shown in Figure 17 has been loaded into the camera:

In this case, the selecting unit 424 is operated so as to select the output of the film information reading and storing unit 421. During the time the film loaded into the camera is fed until the first frame thereof becomes opposed to the shutter, the film information apertures are photoelectrically detected by the light-emitting and light-receiving unit 420 and the film information is stored in the reading and storing unit 421. Thereafter, the lever 330 of Figure 17 is displaced in the direction of arrow in response to the film counter. Thus, the light-emitting and light-receiving unit 420 acts as the data photographing light source and the film illumination measuring light-receiving element. The selecting unit 424 puts out the film speed signal from the storing unit 421 to the output line 424a and the film type signal to the output line 424b. On the basis of this film speed signal, the exposure control unit 425 controls the exposure to a proper value. When the exposure control unit 425 releases the shutter, the light-emitting and light-receiving unit 420 delivers to the data photographing control unit 426 a metering output associated with the illumination of the small portion Fd of the film in which data is to be photographed. The data photographing control unit 426 calculates an optimum quantity of light of the photographing light source determined by the type of the film and the brightness of the object image from the metering output from the light-emitting and light-receiving unit 420 and the film speed signal and film type signal from the selecting unit 424. Immediately after this calculation, the control unit 426 causes the light-emitting element 1 of the light-emitting and light-receiving unit 420 to emit light with the calculated quantity of light. This light passes through the light transmitting means 427 and photographs the data recording medium 428 onto the film.

(B) A case where use is made of a film magazine provided with a film speed signal:

In this case, the selecting unit 424 is operated so as to select the output of the magazine information detecting unit 422. The film speed signal detected from the magazine by this detecting unit 422 is delivered through the selecting unit 424 to the exposure control unit 425 and the data photographing control unit 426. The operation thereafter is similar to what has been described previously.

(C) A case where use is made of a film having no film information signal:

In this case, the photographer introduces the film speed into the film speed manual setting unit 423. The selecting unit 424 is operated so as to select the output of the setting unit 423. The film speed signal from the setting unit 423 is delivered from the selecting unit 424 to the exposure control unit 425 and the data photographing control unit 426. The operation thereafter is similar to what has been described previously.

In the above-described embodiment, where the film information is detected from the magazine and where the film speed is manually set, the film type signal has not been introduced. Description will therefore be made of a modification in which the film type signal can be manually introduced.

In Figure 20, units 421—425 are entirely identical to those shown in Figure 19 and these are provided on the camera body 310 side. A film type setting dial 430 has an index mark 430a thereupon. When a film having film information apertures is used, the index mark 430a is registered with a mark A; when a film having no film information aperture is used and when the film is a colored positive or negative one, the index mark 430a is registered with a mark CP or CN; and when the film is a monochromatic positive or negative one, the index mark 430a is registered with a mark B · W, P or B · W, N. A film type introducing unit 431 delivers an output signal corresponding to the setting of the dial 430 to a warning unit 432 and a data photographing control unit 433. The warning unit 432 produces a warning when the selection of the selecting unit 424 and the setting of the dial 430 are contradictory with each other, for example, when the selecting unit 424 selects the film information reading and storing unit 421, whereas the dial 430 is not set to the mark A. The data photographing control unit 433 controls the quantity of emitted light of the data photographing unit 434 on the basis of the outputs 424a and 424b of the selecting unit 424 and the output of the introducing unit 431. That is, where use is made of a film having film information apertures, the quantity of emitted light for data photographing is calculated from the film speed signal 424a and film type signal 424b from the selecting unit 424, and where other film is used, the quantity of emitted light is calculated from the film speed signal 424a from the selecting unit 424 and the film type signal from the introducing unit.

The present invention is not restricted to the above-described embodiments, but for example, data photographing may also be accomplished by an intimate contact system without using a data photographing lens and the direction of data photographing may be from the front surface of the film instead of from the reverse side thereof.

CLAIMS

1. In a device for photoelectrically detecting an opening formed in a roll film in a camera wherein the roll film is fed from a film supply chamber to a film take-up chamber through the clearance between a first wall surface and a second wall surface facing said first wall surface with a predetermined clearance therebetween and an exposure aperture is formed in one of said first wall surface and second wall surface, the improvement comprising:

a) a light-emitting element and a light-receiving element both disposed on the opposite side of said clearance with respect to said first wall surface; and

b) light-directing means for directing a light beam from said light-emitting element onto said film on the locus on which said opening moves during feeding of said roll film and for directing the light beam passed through said film and/or said opening to said light-receiving element.

2. The improvement recited in Claim 1, wherein said light-directing means includes transmitting means (10a, 21a) for enabling said light beam to be transmitted through said first wall surface, said transmitting means being provided on said first wall surface opposed to the locus of said opening, and means for directing the light beam from said light-emitting element to said light-receiving element after reflected at least once.

3. The improvement recited in Claim 2, wherein said light-directing means includes optical means (30, 130) including a reflecting surface provided between at least one of said light-emitting element and said light-receiving element and said transmitting means.

4. The improvement recited in Claim 2, wherein said light-directing means further includes transmitting means (21a, 10a) provided on said second wall surface opposed to said transmitting means of said first wall surface and enabling said light beam to be transmitted through said second wall surface.

5. The improvement recited in Claim 4, wherein said light-directing means includes optical means (40, 140) including a reflecting surface disposed on the light path of the light beam transmitted through said second wall surface on the opposite side of said clearance with respect to said second wall surface.

6. The improvement recited in Claim 5, wherein said light-directing means includes by-pass means for forming a light path communicating said reflecting surface and the opposite side of said first wall surface while by-passing with respect to said fed film.

7. The improvement recited in Claim 1, wherein said light-directing means includes:

a) light transmitting means (221a, 210a, 321a) provided on said second wall surface opposed to the locus of said opening; and

b) means (50, 70 80) for optically coupling said light-emitting element to said light transmitting means and said light transmitting means to said light-receiving element.

8. The improvement recited in Claim 7, wherein said coupling means includes means for directing the light beam from said light-emitting element to said light transmitting means after reflected at least once and for directing the light beam from said light transmitting means to said light-receiving element after reflected at least once.

9. The improvement recited in Claim 8, wherein said coupling means includes:

a) optical means including a reflecting surface disposed in opposed relationship with said light transmitting means on the opposite side of said clearance with respect to said second wall surface; and

b) by-pass means for forming a light path communicating said reflecting surface and the reflection side of said first wall surface while by-passing with respect to said fed film to direct the light beam from said light-emitting element to said light transmitting means through said reflecting surface and to direct to said light-receiving element the light beam from said light transmitting means reflected by said reflecting surface.

10. The improvement recited in Claim 1, wherein said camera includes a device for photographing a photography data onto said film by the light from a light source, the opening formed in said film represents the information for identifying the type of the film, and said photoelectric detecting device further includes means for controlling the quantity of emitted light of the light source for said data photographing device on the basis of the detection by said light-receiving element.

11. In a camera including a detecting device for photoelectrically detecting at least one opening formed in the roll film moved from a film supply chamber toward a film take-up chamber and representing the information for identifying the type of the film and for putting out a signal corresponding to the type of said film, and a device for applying a light beam having a photography data onto said film and photographing said data onto said film, the improvement comprising:

means for controlling the quantity of application of said light beam by said data photographing device in accordance with the output signal of said detecting device.

12. The improvement recited in Claim 11, wherein said camera includes:

a) a light-emitting element having a quantity of emitted light controllable by said control means;

b) first light-directing means for directing the light beam from said light-emitting element onto said film on the locus of movement of said opening resulting from movement of said film and directing to said light-receiving element the light beam passed through said film and/or said opening; and

c) second light-directing means for directing the light beam from said light-emitting element to said data photographing device.

13. A device for use in a camera for detecting markings in a film, said device comprising a light emitting element and a light receiving element both disposed on the same side of the path of the film, and light directing means arranged to be responsive to the marking for directing light from the light emitting element towards the light receiving element.

14. A camera having means for detecting information on a film, means for marking further

information on the film, and control means responsive to the detecting means for controlling the marking means.

15. A device substantially as herein particularly described with reference to and as illustrated in the accompanying drawings.

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